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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/710,419

07/09/2004

Min-Lung Huang

11579-US-PA

4418

31561

7590

05/08/2006

JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN

EXAMINER

MAI, ANH D

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 05/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/710,419

Applicant(s)

HUANG, MIN-LUNG

Examiner

Anh D. Mai

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 February 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 July 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election without traverse of Group I, claims 1-13 in the reply filed on February 24, 2006 is acknowledged. Non-elected invention, claims 14-22 have been canceled.

### *Specification*

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested:

BUMP ELECTRODES HAVING MULTIPLE UNDER BALL METALLURGY (UBM) LAYERS.

### *Claim Objections*

3. Claim 1 is objected to because of the following informalities:

Lines 6-7, recites: "wherein the bonding pads are exposed by the first passivation layer".

However, as an apparatus, the bonding pads are not exposed because other layers are formed on the bonding pads.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-6, 8-11 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Kelkar et al. (U.S. Patent No. 6,462,426).

With respect to claim 1, as best understood by the examiner, Kelkar teaches a wafer structure as claimed including:

a wafer (208) having a plurality of bonding pads (204), wherein the bonding pads (204) are disposed on an active surface of the wafer;

a first passivation layer (206) covering the active surface of the wafer, wherein the bonding pads (204) are exposed by the first passivation layer (206);

an under ball metallurgy (UBM) layer disposed on each of the bonding pads (204), wherein the UBM layer comprises a first metallic layer (202) and a second metallic layer (212) disposed on the first metallic layer (202), the first metallic layer (202) covering a portion of the first passivation layer (206),

a second passivation layer (210) disposed on the first passivation layer (206), wherein the second passivation layer (210) covers a peripheral portion of the first metallic layer (202), without covering the second metallic layer (212); and

a plurality of bumps (214), disposed on the UBM layer. (See Fig. 2).

With respect to claim 2, the UBM layer of Kelkar comprises:

an adhesion layer, disposed on the bonding pad (204);

a barrier layer disposed on the adhesion layer;

a wetting layer disposed between the barrier layer and the bump.

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With respect to claim 3, the adhesion layer of Kelkar is a single layer or comprises a plurality of layers.

With respect to claim 4, the barrier layer of Kelkar is a single layer or comprises a plurality of layers.

With respect to claim 5, the wetting layer of Kelkar is a single layer or comprises a plurality of layers.

With respect to claim 6, the first metallic layer (202) of Kelkar includes the adhesion layer (202) and the second metallic layer (212) includes the barrier layer (218) and the wetting layer (220).

With respect to claim 8, a material of the adhesion layer (202) of Kelkar is titanium or aluminum.

With respect to claim 9, a material of the barrier layer (218) of Kelkar is selected from the group consisting of nickel-vanadium alloy, titanium nitride, tantalum nitride and nickel.

With respect to claim 10, a material of the wetting layer (220) of Kelkar includes copper.

With respect to claim 11, a material of the second passivation layer (210) is benzocyclobutene (BCB) or polyimide (PI).

With respect to claim 13, the bumps (214) of Kelkar is a globular shapes or pillar shapes.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 7 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kelkar '426 as applied to claim 2 above, and further in view of Greer (U.S. Patent No. 6,451,681).

With respect to claim 7, Kelkar teaches the first metallic layer (202) includes the adhesion layer and the second metallic layer (212) includes the wetting layer (220).

Kelkar also teaches the first metallic layer 202 may be formed of other conductive materials.

Thus, Kelkar is shown to teach all the features of the claim with the exception of explicitly disclosing the first metallic layer to further include the barrier layer.

However, Greer teaches an UBM including a first metallic layer (312) to includes an adhesion layer (200) and a barrier layer (202). (See Fig. 3),

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the first metallic layer of Kelkar to include barrier layer as taught by Greer to prevent cracks from propagating through the integrated circuit.

With respect to claim 12, the material of the bumps (310) of Greer includes conventional tin/lead alloy.

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***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 8:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



**ANH D. MAI  
PRIMARY EXAMINER**